

Looking Westward with Both Reversible Track Signals Showing Green (White in Illustration)

Modern Signals Expedite Heavy Suburban Traffic

Color-Light Signals and Traffic Levers Increase Capacity of Available Tracks on Lackawanna

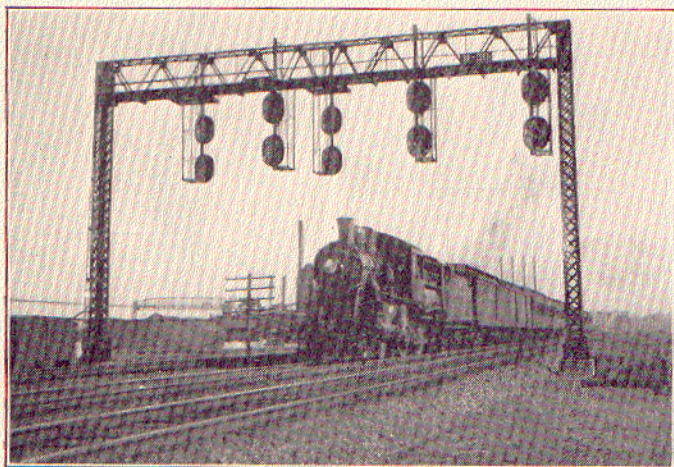
OPERATION of the Lackawanna's suburban trains in the New York district has been facilitated by the adoption on the section of line most difficult to operate of advanced operating methods, made possible by the installation of a highly developed signal plant using color-light indications throughout.

The section where the measures for improvement were taken lies between the Hackensack and Passaic rivers on the

The problem was to secure the greatest possible utilization of available running tracks as soon as the drawbridges were closed. Formerly trains so held up had to follow each other on one track, assuming again the space interval maintained by automatic block signals. Thus the opening of a drawbridge during the rush hour would cause delays to some trains much greater than the period of time when the draw was open.

The seriousness of the open drawbridge as a source of delay to trains can readily be understood when the company's figures of trains thus delayed are examined. In June, 1922, a typical month, a total of 4,491 suburban trains were run. Of these 179 met with delays and the delay to 104 (58 per cent) of these was chargeable to open drawbridges. On at least two occasions in the past the road has joined with others in the attempt to secure a ruling to the effect that drawbridges need not be opened during rush hours. On both occasions, however, river shipping interests with powerful political influence were able to defeat the railroads' proposals. The result is that during almost any rush suburban hour may be seen the ludicrous spectacle of a tugboat towing a sand barge through a drawbridge to the delay and inconvenience of thousands of passengers.

The increase in the Lackawanna's suburban passenger traffic has been very great in recent years. The road is now handling about 21,500,000 passengers a year at its Hoboken terminal and all but about 800,000 of these travel on suburban trains, by far the greater number of which move over the Morristown branch through Newark. Westbound through trains likewise move over this line, while eastbound through trains, a few suburban trains and practically all the road's freight trains move over the Boonton branch through Paterson. It is the line through Newark then, which has had to bear the brunt of the heavy increase in suburban traffic. Over this line are scheduled more than 160 passenger trains a day. Most of these trains are of all-steel equipment and during the rush periods they run from eight to twelve cars. Superheated steam eight-wheel, ten-wheel and Pacific type locomotives are used, frequently double-headed. Originally a double track line, it had been increased to three tracks



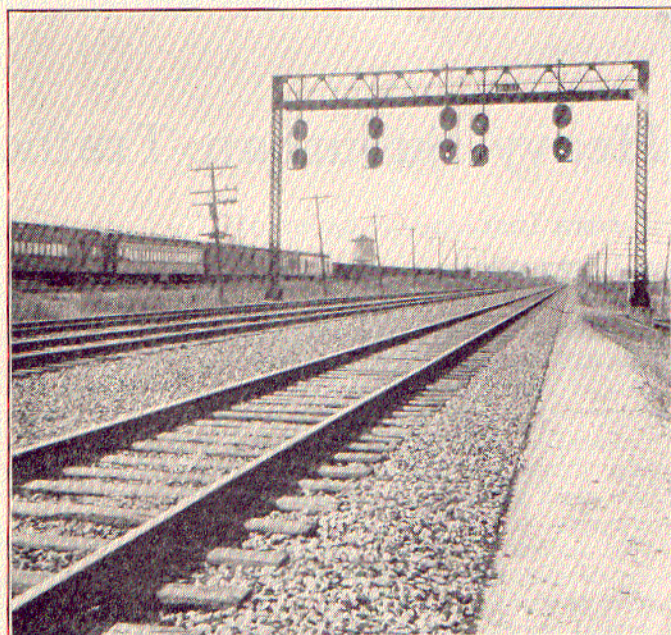
Looking Eastward with Hackensack Bridge in the Distance

The Three Eastbound and Two Westbound Signals Show the Two Reversible Tracks and the One Non-Reversible Eastbound Track. Train Is Westbound on No. 1 Track (Reversible)

road's Morristown branch, its heavy suburban line. Operating troubles, aside from those normally encountered in handling heavy traffic with a limited number of trucks, arise principally from the drawbridges over the Hackensack and Passaic rivers. Traffic in these rivers, particularly the former, is heavy and is increasing. With trains during the rush periods following each other at intervals of from one to five minutes, the opening of either drawbridge for a few minutes results in holding up perhaps as many as a dozen trains.

from Newark to Roseville avenue and from Orange to Millburn. The addition of a third track from Roseville avenue to Orange to connect these two three-track sections is now under way and, when completed will give the road nine miles of unbroken three-track line westward from Newark. From Hoboken terminal to West End tower, 1.9 miles, where the Boonton branch leaves the Morristown branch, there are four main tracks. It is on the line between West End tower and Newark, 5.9 miles, where the improvements described herein have been made.

The drawbridges over the Passaic and Hackensack rivers are double track. The section of line between these two bridges was also double track, and there was in addition a third track of light construction used for freight switching movements but not for passenger traffic. The first step taken to improve operating conditions was to rebuild this track applying heavier rail and rock ballast and making it available for passenger trains. The double track drawbridges were not altered, however, and no other track changes were



Looking Westward Near Sanford's Crossing

Strong Green Lights of Reversible Track Westbound Signals Show White in Illustration. In the Distance Two More Signal Bridges can be Seen, Showing the Close Spacing of Signals.

made, with the exception of providing crossovers where needed. The company then had (1) a four-track line from Hoboken terminal, 1.9 miles, to West End tower (which is just east of the Hackensack river); (2) a short double track line across the Hackensack river; (3) a three-track line from the Hackensack river to the Passaic river; (4) a short double-track line over the Passaic river to Newark and (5) a three-track line from Newark west. The problem was to secure the greatest possible efficiency from the two double-track sections over the rivers and the three-track section between them, in order to clear away as rapidly as possible any congestion of traffic occasioned by the opening of a drawbridge and any normal congestion which might result by reason of the two short double-track sections in a territory where three or four tracks have been found necessary to meet the demands of traffic.

Ordinarily where three running tracks are provided two of them may be used in one direction only and the third is reversible during certain hours of the day. The Lackawanna has improved upon this practice by making only one of its three tracks, i.e., track No. 2, between the rivers usable in one direction only, viz., eastward. The other two tracks, No. 1 and No. 3, are reversible, and not during certain hours

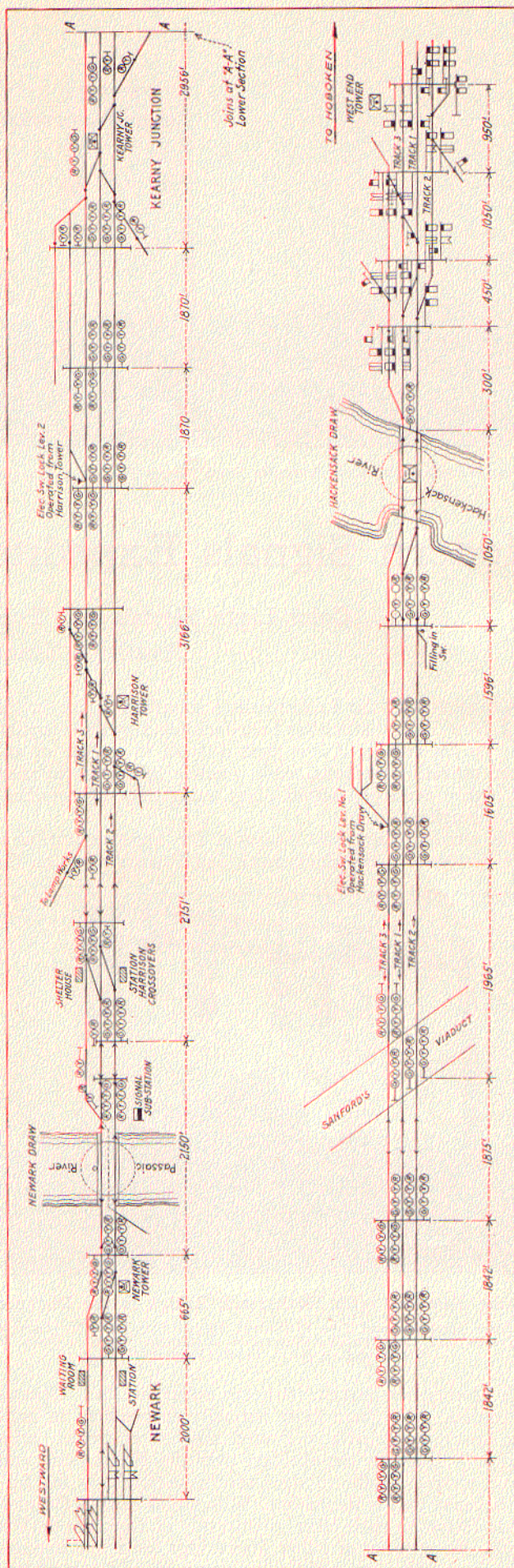


Diagram Showing Color Light Signals Between West End and Newark—Upper Section Joins Lower at Left

of the day only but at all times. Furthermore, both of the two tracks over the rivers are reversible at all times. By the addition of this track the road has doubled the capacity of this section of its line, allowing for ten trains in a given direction where there was room for but five before.

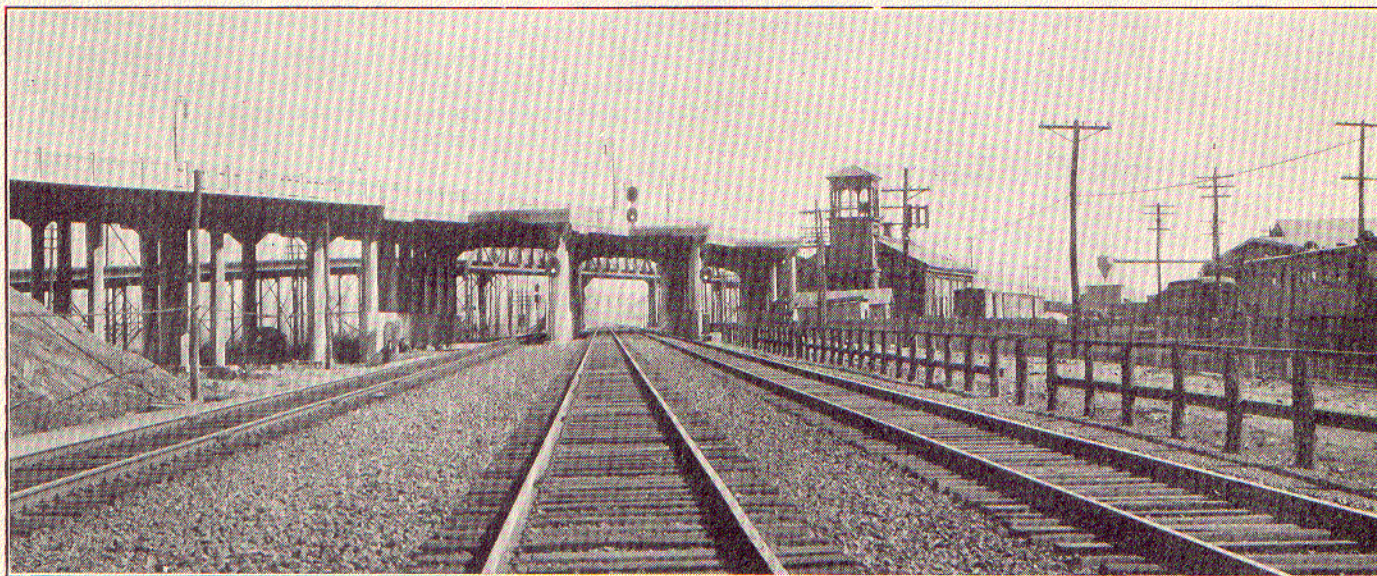
Without the most modern signaling equipment, however, it would not be practicable to reverse the direction of traffic over a given track at any time during the day. Traffic levers, therefore, are provided in all the signal towers between Newark and West End tower to control the operation of the reversible tracks. The traffic lever must be set in proper position before a signalman can display a clear signal to a train on a reversible track and the signalman cannot place his lever in proper position unless the signalman in the next tower places his lever governing that section of track in the same position. This the second signalman cannot do until he has displayed the stop signal against opposing movement.

For example, take the rush period in the morning when the heaviest movement is eastbound. Assume that two eastbound trains arrive at Newark simultaneously, one on track No. 1 and the other on track No. 2. Naturally, during this period one of the two bridge tracks, i.e., No. 2, will have its traffic levers set normally for eastbound movement, so one

bound. At the drawbridges one track will normally be lined up for eastbound and the other for westbound movement. Under normal conditions very little changing of traffic levers is necessary, except that governing one of each of the bridge tracks and to allow for freight switching movements over track No. 3. During the evening (westbound) rush both reversible tracks between the rivers are lined up for westbound movement and eastbound traffic moves exclusively over No. 2, the non-reversible track. At the bridges, one track (No. 1) is lined up for west bound and one (No. 2) for eastbound movement and frequent shifting of levers will occur only for one of these tracks on each bridge when they are used, temporarily, for westbound trains.

In spite of the fact, however, that only at the bridges are changes in the direction of traffic sufficiently numerous to bring the levers into frequent use, the provision of them elsewhere makes for a flexibility of operation which in turn reduces to a minimum delays to following trains by derailment or by signal failures. If a reversible track is blocked for any cause, a signalman has only to shift the traffic lever for the remaining reversible track and following trains, crossing over, may proceed without delay.

The automatic signals in this territory are noteworthy.



Locking Eastward at Sanford's Crossing—All Signals Clear—Next Signal Bridge Visible in Distance

of the trains will naturally find the signals in position for its movement. The signalman, however, is aware of the approach of the second train and, let us assume, knows that no westbound trains are due. He will try to move his traffic lever governing track No. 1 to allow the second train to proceed over it. If the signalman at Harrison tower cooperates, sets his signal against opposing westward movement and moves his lever as desired, then the signalman at Newark can allow the second train, as well as the first, to proceed on its journey without delay, using track No. 1 over the bridge. Without the traffic lever, he would have to hold the second train until the first had departed and cleared the block on track No. 2.

Traffic levers are provided similarly to govern the two reversible tracks, Nos. 1 and 3, between Harrison tower and Kearney Junction, Kearney Junction and the Hackensack bridge tower and Hackensack bridge tower and West End tower. In practice there is not much frequency in reversing the direction of traffic except over the two drawbridges. Over the three track section one track, No. 2, is non-reversible eastbound. During the morning rush the traffic levers will be lined up to convert one of the reversible tracks, i.e., No. 1, also to eastbound movement and the other (No. 3) to west-

bound. They, as well as the interlocking signals, are exclusively of the color-light type, using high voltage alternating current supplied by the company from its Hoboken power house, with a connection to the power lines of the Public Service Electric Company as an auxiliary source of supply. Fog and smoke often seriously obstruct vision in the Hackensack meadows and the color lights have a higher degree of visibility by either day or night than any other type of signal under these conditions. All interlocking plants in the territory are of the electro-pneumatic type of the latest design. Automatic block signals have four indications, as follows:

Color given by	Indication
1. Red Light over Yellow Light.....	Stop and proceed
2. One Yellow Light.....	Approach Next Signal Prepared to Stop
3. Yellow Light over Green Light.....	Approach Next Signal at Restricted Speed
4. One Green Light.....	Proceed

The signals on these tracks are close together, a number of them being only about 1,800 ft. apart. This, of course, makes for high track capacity. Furthermore, with four indications, high speeds when the clear indication is given are safer than where only three indications are provided. The engineman will pass two warning signals, allowing ample time for reducing speed, before he comes to a stop signal.

The Lackawanna has, therefore, not only doubled the capacity of its line across the meadows by the addition of another running track—it has also made safe high rates of speed by the use of four-indication signals.

High interlocking signals have six indications, as follows:

Color given by	Indication
1. One Red Light.....	Stop
2. Red Light Over Yellow Light.....	Proceed at Slow Speed Prepared to Stop
3. One Yellow Light.....	Approach Next Signal Prepared to Stop
4. Yellow Light over Green Light.....	Approach Next Signal at Restricted Speed
5. Red Light over Green Light.....	Proceed at Restricted Speed
6. One Green Light.....	Proceed

Slow speed interlocking signals have two indications: One red light, indicating stop, and one yellow light, indicating proceed at slow speed prepared to stop.

Telephones have been provided at all signal bridges and main line switches have been provided with electric switch locks controlled by towermen.

Officers of the company hold the new signal system and the results they are obtaining from it in high regard. They report, too, that enginemen, although at first rather doubtful about the color-light signal, now are enthusiastic about it. The company is extending this form of signaling westward to Orange in connection with its extensive track elevation work at East Orange. When this work is completed, the company will have 9.4 miles of its line of heaviest traffic equipped exclusively with this type of signal.

Freight Car Loading

WASHINGTON, D. C.

REVENUE FREIGHT loading in the week ended October 14 increased 15,301 cars as compared with the week before, but was still slightly below that for the week of September 30, which was the largest so far this year. The total was 983,470, as compared with 910,529 in the corresponding week of last year and 1,018,539 in the corresponding week of 1920. The loading for that week of 1920 was the heaviest for any one week in the history of American railroads. The loading for the corresponding week this year is 3.4 per cent below that figure.

In the Southern, Central Western and Southwestern districts the loading was in excess of that for the corresponding week of 1920 and in all districts except the Pocahontas it was in excess of that for last year. Increases as compared with the preceding week were shown in grain and grain prod-

ucts, coal, coke, forest products and miscellaneous, but there were decreases in live stock, ore, and merchandise l.c.l. As compared with the corresponding week of last year there were increases in all classes of commodities except merchandise, l.c.l. This is regarded as an excellent indication of the improvement in business conditions as in dull times much freight is shipped in less than carload lots which at other times would be shipped in full carloads. The summary as compiled by the Car Service Division of the American Railway Association is given below.

The car shortage showed a further increase during the first week of October to 141,252, of which 40,499 were coal cars and 71,063 were box cars. At the same time there were surpluses averaging 5,500, including 3,024 coal cars and 97 box cars. During the period October 8-15 there was a further increase in the shortage to 156,309, while the surplus was reduced to 4,275. The shortages included 77,111 box cars, 44,984 coal cars and 7,631 refrigerator cars.

An improvement in the motive power situation is shown by reports filed today by the carriers with the Car Service Division. On October 1, 19,727 locomotives, or 30.6 per cent of the total on line were in need of repairs. On September 15, last, 20,157, or 31.4 per cent were in need of repairs. This was a net decrease during the last half of September of 430 locomotives.

At the same time, the railroads on October 1 had 44,703 serviceable locomotives which was an increase of 538 over the number serviceable on September 15. This increase was due to the larger number being repaired and turned out of the shops, and also to the installation of new locomotives.

Of the total number in need of repairs on October 1 last, 16,313 were in need of repairs requiring more than 24 hours. This was a decrease of 259 under September 15. There were also 3,414 locomotives in need of light repairs which was a decrease of 171 since September 15. From September 1 to September 15, 9,047 locomotives were repaired and turned out of railroad shops, while from September 15 to October 1, the total was 11,213, or an increase of 2,166 over the first half of the month.

The number of serviceable locomotives stored in October 1 was 1,501.

THE PORT HURON & DETROIT is being operated as a separate property, the contract under which it was operated by the Detroit, Bay City & Western having been terminated by mutual consent.

REVENUE FREIGHT LOADED

SUMMARY—ALL DISTRICTS, COMPARISON OF TOTALS THIS YEAR, LAST YEAR, TWO YEARS AGO. WEEK ENDED SATURDAY, OCTOBER 14, 1922

Districts	Year	Grain and grain products	Live stock	Coal	Coke	Forest products	Ore	Mdse. L.C.L.	Miscellaneous	Total revenue freight loaded		
										This year, 1922	Corresponding year, 1921	Corresponding year, 1920
Eastern	1922	8,913	3,281	59,410	1,847	5,776	4,876	62,654	92,441	239,198	216,317	246,966
	1921	8,799	3,383	51,741	1,889	4,392	1,162	62,150	82,801	.....	.....	.....
	1920	3,179	3,207	59,503	5,179	3,183	9,350	43,871	74,156	201,628	175,690	214,605
Alleghany	1922	2,477	3,280	53,434	2,666	2,949	2,949	48,647	59,288	.....	.....	.....
	1921	224	369	18,156	275	1,498	25	5,373	4,379	29,502	36,826	37,694
	1920	212	474	25,137	172	1,221	111	5,569	4,030	.....	.....	.....
Pocahontas	1922	3,632	2,539	22,769	1,074	20,080	1,261	39,064	46,304	136,723	132,745	135,338
	1921	3,434	2,361	26,990	466	16,838	508	40,324	41,834	.....	.....	.....
	1920	18,792	9,769	10,005	1,300	15,096	28,314	28,314	42,406	153,996	134,752	167,939
Southern	1922	15,682	9,030	11,110	741	12,766	13,655	29,189	42,579	150,820	146,145	145,513
	1921	18,554	15,843	19,825	386	7,311	2,108	31,474	61,319	.....	.....	.....
	1920	13,004	14,065	21,997	218	7,191	736	32,063	56,871	.....	.....	.....
Central Western	1922	5,198	4,133	7,258	147	6,783	425	15,373	32,286	71,603	71,603	70,484
	1921	4,239	3,416	5,138	147	7,405	799	16,458	30,452	68,054	68,054	70,484
Southwestern	1922	36,544	29,745	37,088	1,833	29,190	30,847	75,161	136,011	376,419	348,951	383,936
	1921	32,923	26,511	38,245	1,106	27,362	15,190	77,710	129,902	.....	.....	.....
	1920	52,492	39,141	196,925	10,208	59,727	46,362	226,123	352,491	983,470	910,529	.....
Total Western Dist.	1922	47,347	36,009	195,547	6,299	52,762	19,820	234,390	317,855	.....	.....	.....
	1921	40,810	35,056	226,671	15,778	60,312	76,429	209,692	353,791	72,941	.....	1,018,539
	1920	4,645	3,132	1,379	3,909	6,965	26,542	.....	34,636	.....	.....	.....
Increase compared	1921	.....	.....	.....	.....	.....	.....	8,267	.....	.....	.....	.....
Decrease compared	1920	.....	.....	.....	.....	.....	.....	16,431	.....	.....	.....	.....
Increase compared	1920	11,682	4,085	.....	.....	.....	.....	.....	1,300	.....	.....	.....
Decrease compared	1920	.....	.....	29,745	5,570	585	30,067	.....	35,069	.....	.....	.....
October 14	1922	52,492	39,141	196,926	10,208	59,727	46,362	226,123	352,491	983,470	910,529	1,018,539
October 7	1922	50,553	39,359	189,312	9,880	57,844	47,439	228,515	345,267	968,169	899,681	1,011,666
September 30	1922	52,129	39,830	189,349	9,456	58,742	49,777	234,517	354,581	988,381	904,831	992,283
September 23	1922	52,379	36,896	187,896	8,671	58,853	49,587	234,371	344,638	973,291	873,641	1,008,109
September 16	1922	52,090	34,929	172,241	8,188	57,371	53,293	234,513	333,294	945,919	852,552	991,166